

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

CONSERVATION CROP ROTATION

(Acre)

Code 328

DEFINITION

Growing crops in a recurring sequence on the same field.

PURPOSES

This practice may be applied as part of a conservation management system to support one or more of the following:

- reduce sheet and rill erosion;
- reduce irrigation induced erosion;
- reduce soil erosion from wind;
- maintain or improve soil organic matter content;
- manage deficient or excess plant nutrients;
- improve water use efficiency;
- manage saline seeps;
- manage plant pests (weeds, insects, diseases);
- provide food for domestic livestock;
- provide food and cover for wildlife, or;
- manage vadose zone salinity levels and saline irrigation waters.

**CONDITIONS WHERE PRACTICE
APPLIES**

This practice applies to all cropland and other land where crops are grown.

This standard does not apply to pastureland, hayland, or other land uses where annual row or close growing crops are grown occasionally only to facilitate renovation or re-establishment of perennial vegetation. It does not apply to land devoted to orchards, vineyards, or nurseries.

CRITERIA

**General Criteria Applicable To All Purposes
Named Above**

To apply this practice, grow crops in a planned, recurring sequence except as outlined in Operation and Maintenance.

To apply this practice, select crops and varieties listed in Colorado State University Cooperative Extension or other approved publications, which are adapted to the climatic region and the soil resource.

A conservation crop rotation may include crops planted for cover or nutrient enhancement, or management.

**Additional Criteria To Reduce Sheet And Rill
Erosion**

To apply this practice, select crops that produce enough above and below ground plant biomass to control erosion, in combination with other practices, within the soil loss tolerance (T) or any other planned soil loss objective.

Use the Revised Universal Soil Loss Equation (RUSLE) to determine the amount of biomass needed.

Calculations shall account for the effects of other practices in the conservation management system.

Additional Criteria To Reduce Irrigation Induced Erosion

When applying this practice to reduce erosion induced by furrow irrigation, select crops or cover crops that grow within the wetted perimeter of the furrow, or which produce the amount of residue needed to be maintained in the furrow to achieve the soil loss objective. The amount of residue needed shall be determined by approved research.

To reduce erosion induced by sprinkler irrigation, select crops or cover crops which develop surface cover or canopy rapidly, or that produce the amount of residue needed to be maintained on the soil surface to achieve the soil loss objective. The amount of residue needed shall be determined by approved research.

Additional Criteria To Reduce Soil Erosion From Wind

To apply this practice, select crops that produce biomass in amounts adequate, and at the appropriate time, to control erosion to within the soil loss tolerance (T) or other planned soil loss objective.

The amount of biomass needed shall be determined using current approved wind erosion prediction technology. Calculations shall account for the effects of other practices in the conservation management system.

Additional Criteria To Maintain Or Improve Soil Organic Matter Content

To apply this practice, select crops that produce the amount of plant biomass needed to maintain soil organic matter content, as determined using the current approved Soil Conditioning Index Procedure.

If partial removal of residue by means such as baling or grazing occurs, enough residue will be maintained to achieve the desired soil organic matter content goal.

Cover and green manure crops planted specifically for soil improvement may be grazed, as long as grazing is managed to retain adequate biomass.

Residues shall not be burned.

Additional Criteria To Manage Deficient Or Excess Plant Nutrients

Determine crop selection and sequence by using an approved nutrient balance procedure.

When crop rotations are designed to add nitrogen to the system, grow nitrogen-fixing crops immediately prior to or interplanted with nitrogen-depleting crops.

To reduce excess nutrients, grow crops or cover crops having rooting depths and nutrient requirements that utilize the excess nutrients.

Additional Criteria To Improve Water Use Efficiency

If this practice is selected for the primary purpose of improving water use efficiency, use an approved water balance procedure to select crops and varieties, sequence of crops, or to choose between planting a crop or fallowing.

Additional Criteria To Manage Saline Seeps

If the primary purpose of selecting this practice is to manage saline seeps, select crops which, when grown in the recharge area of saline seeps, provide rooting depths and water requirements adequate to fully utilize all plant available soil water. Summer fallow will not be used. Use an approved water balance procedure to determine crop selection and sequence.

If excess subsoil moisture exists below the rooting depth of crops commonly grown in the recharge area, establish and maintain deep-rooted perennial crops for the number of years needed to dry the soil profile.

Select crops grown in the discharge area of saline seeps for their tolerance to salinity levels in the discharge area.

Additional Criteria To Manage Plant Pests (Weeds, Insects, Diseases)

When this practice is selected for the primary purpose of managing plant pests, alternate crops to break the pest cycle and/or allow for the use of a variety of other control methods. Remove affected crops and alternate host crops from the rotation for the period of time needed to break the life cycle of the targeted pest.

Select resistant varieties, listed in appropriate Colorado State University Extension publications or other approved sources, where there is a history of a pest problem.

Additional Criteria To Provide Food For Domestic Livestock

When this practice is selected for the primary purpose of providing food for domestic livestock, select crops to balance the feed supply with livestock numbers. Use an approved forage-livestock balance procedure to determine the amount of the selected crop that is needed.

Additional Criteria To Provide Food And Cover For Wildlife

When this practice is selected for the primary purpose of providing food and cover for wildlife, use an approved habitat evaluation procedure to select suitable crops.

Additional Criteria To Manage Vadose Zone Salinity Levels And Saline Irrigation Waters

When this practice is selected for the primary purpose to manage soil and irrigation water salinity, select crops and crop sequences for: 1) the maximum allowable salinity level (threshold), and; 2) the percent yield decrease per unit increase of salinity in excess of the threshold (slope) balanced against yield expectations.

The leaching fraction (LF) and electrical conductivity of the soil-water percolating from the bottom of the root zone (EC_{dw}) will be calculated as part of the specifications for establishment and operation of this practice when salinity is a concern.

CONSIDERATIONS

When used in combination with CROSS WIND STRIPCROPPING (589B) or STRIPCROPPING CONTOUR (585), the crop sequence should be consistent with the strip cropping design.

When used in combination with RESIDUE MANAGEMENT practices, selection of high residue producing crops and varieties, use of cover crops, and adjustment of plant population and row spacing can enhance production of the kind, amount, and distribution of residue needed.

Where erosion induced by furrow irrigation is a concern, irrigating only alternate furrows may reduce the erosion hazard and provide better soil aeration.

Where erosion induced by sprinkler irrigation is a concern, the hazard can be reduced by basin tillage (dammer-diker), contour farming, or contour strip cropping.

Soil conditioners such as polyacrylamides may also be considered to improve infiltration potential and to reduce irrigation induced erosion.

Where maintaining or improving soil organic matter content is an objective, the effects of this practice can be enhanced by managing crop residues, utilizing animal wastes, or applying mulches to supplement the biomass produced by crops in the rotation.

Where rapid residue decomposition is desirable, residue should be incorporated into the soil before the 6 inch midday soil temperatures drop below 60 degrees Fahrenheit in the fall. If irrigation is available, maintain soil moisture at or above 50 percent available water holding capacity.

Where excess plant nutrients or soil contaminants are a concern, rotating deep rooted crops or cover crops with shallow rooted crops can help recover the nutrient or contaminant from the soil profile.

Where precipitation is limited, seasonal, or erratic, moisture can be conserved for crop use by maintaining crop residues on the soil surface to increase infiltration and to reduce runoff and evaporation. Where winter precipitation occurs as snow, additional moisture can be obtained for crop use by trapping snow with standing residue, windbreaks, or other barriers.

Where improving water use efficiency on deep soils is a concern, rotating deep rooted crops with shallow rooted crops can help utilize all available water in the soil profile.

Crop damage by wind erosion can be reduced by this practice by selecting crops which are tolerant to abrasion from wind blown soil or tolerant to high wind velocity. If crops sensitive to wind erosion damage are grown, the potential for plant damage can be reduced by crop residue management, field windbreaks, herbaceous wind barriers, intercropping, or other methods of wind erosion control.

Soil compaction can be reduced by this practice when rotations including deep rooted crops (able to extend to and penetrate the compacted soil layers) are used in combination with deep tillage, controlled traffic, or management of grazing animals to prevent, or breakup, compacted layers.

Salt tolerance of crops varies considerably among species, but also is highly dependent on cultural conditions. Yield response relations show that crops tolerate salinity up to a threshold level. Salinity levels that exceed this threshold result in linear yield decreases as salinity increases.

As the salt contents of irrigation waters increase greater care must be taken to plant crops tolerant to the expected vadose zone salinity and to take appropriate steps to optimize root zone salt accumulations through proper leaching techniques.

PLANS AND SPECIFICATIONS

Specifications for establishment and operation of this practice shall be prepared for each field or treatment unit according to the Criteria, Considerations, and Operation and Maintenance described in this standard.

Specifications shall be recorded using approved specification sheets, job sheets, narrative statements in the conservation plan, or other acceptable documentation.

OPERATION AND MAINTENANCE

Rotations shall provide for acceptable substitute crops in case of crop failure or shift in planting intentions for weather related or economic reasons. Acceptable substitutes are crops having similar properties that meet the criteria for all the resource concerns identified for the field or treatment unit.

In areas where summer fallow is practiced, the decision to plant a crop or fallow shall be made annually based on soil moisture at planting time. Fields shall be fallowed only when soil moisture is not adequate to produce a crop. If moisture supply is adequate but limited, short-season shallow rooted crops shall be selected and grown. Deep rooted crops shall follow shallow rooted crops in subsequent years, if needed, to utilize all plant available water in the root zone.

REFERENCES

Agriculture Handbook Number 703, Predicting Soil Erosion by Water: A Guide To Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE).

Colorado Field Office Technical Guide, Section IV.

Colorado Field Office Technical Guide, Section V.